Cross-Community Influence Analysis and Maximisation

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I. INTRODUCTION

Relationships in social networks are often analysed on a node-to-node scale, e.g. egocentric analysis [1], or in terms of the relationships between an actor and its community, e.g. community-finding [2]. However, less work has been done on analysing aggregated relations between communities, i.e. on the cross-community level, which offers complementary insights into social network dynamics at a different level of granularity. We are particularly interested in the measurement and prediction of influence one community has on another. We define this influence in the context of overlapping discussion communities — as the ability one community has to stimulate another one towards higher activity, measured by the number of replies.

We therefore developed a framework for cross-community influence analysis which extends the notion of actor centrality to the cross-community level: it defines the influence of community A on B as the average number of replies members of A received in B, weighted by the degree of membership in A. We evaluated the framework by conducting a series of experiments on 10 years of data from the largest Irish discussion system, Boards.ie. First, we investigated mutual influence between communities and their dynamics. We then used the framework to predict which communities to target in order to maximise information diffusion [3] in the underlaying social network.

To the best of our knowledge, cross-community influence and its maximisation has not yet been addressed, motivated by the fact that in discussion fora the information is typically shared to the community as a whole rather than to individual users.

II. RESULTS

Our initial findings show that the framework identified communities which intuitively had high influence on other communities, such as system administrators or moderators. This was further supported by our experiments with a diffusion model. From each out of $q \in [1, 5]$ targeted communities, we sampled 1–50 seed nodes, and measured the fraction of all users activated at the end of the diffusion process. This process was repeated for three different targeting strategies: our framework, group in-degree [4], and random baseline. The results showed that our method performs better than the other investigated strategies up to the factor of 2, when only one community has been targeted and only one user sampled from the community.

III. CONCLUSION

We have developed a novel framework for cross-community influence analysis, which proved to be useful for the measurement and prediction of how one community influences other communities. In future we aim to extend the framework with topic analysis.1

REFERENCES


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